

The Examiner contends that Sasaki discloses catalyst compositions that are mixed metal oxides containing iron, antimony, vanadium and at least one alkali or alkaline earth metal and aluminum. The Examiner contends the difference between instant claims and the prior art is that the prior art does not identically disclose the amounts of each catalyst component in applicants claims. The Examiner contends there is overlap between the catalyst ingredients.

The Examiner contends that Sasaki discloses both amorphous and crystalline materials. The Examiner also contends that although the intermediate iron antimonate of the Sasaki examples is crystalline there is no specific evidence that the final product is also crystalline. The Examiner also contends that even if the final product of Sasaki has the same crystalline structure as the intermediate, that Sasaki nevertheless envisions amorphous materials as a non-preferred embodiment as shown in the comparative examples of Sasaki.

Evidence that the Sasaki catalyst are crystalline

Sasaki itself provides evidence that the Sasaki catalyst compositions have are crystalline. Independent claims 1 and 5 of Sasaki both list as a claim element a “catalyst composition containing a crystalline iron antimonate.” This is further supported by Sasaki at col. 2, lines 56 and 57. Additionally, Sasaki states at col. 3, lines 6-10:

“it is essential that the catalyst composition of the present invention should contain Fe, Sb, and at least one of V, Mo, and W in specific ratios as specified by the above imperial formula and contain iron antimonate in a crystalline form.”(Emphasis added).

Additionally Sasaki at col.3, lines 36-38 states:

“The presence of crystalline iron antimonate in the catalyst system according to the present convention can be confirmed by the x-ray diffractometry.”(Emphasis added).

The following references (copies enclosed) show that the crystalline iron antimonate added in the preparation of the final catalyst composition of Sasaki would remain crystalline in the final catalyst composition. Iron antimonate with tetragonal

(rutile) structure can be obtained by coprecipitation or by mixing iron and antimony oxides followed by calcination at temperatures of 500°C or higher. Once formed, this crystalline structure appears to be stable at temperatures up to 900°C [see Table 1 in G.I. Straguzzi, K.B. Bishoff, T.A. Koch and G.C.A. Schuit, *J. Catal.*, 103 (1987) 357 at 359]. The impregnation of iron antimonate with different amounts of antimony, iron and other elements and subsequent recalcination at 700°C does not show any change in the crystalline structure of iron antimonate [G.I. Straguzzi, K.B. Bishoff, T.A. Koch and G.C.A. Schuit, *J. Catal.*, 103 (1987) 357 at 360; F.Y. Qiu, L.T. Weng, P. Ruiz and B. Delmon, *Applied Catal.*, 47 (1989) 115-123 at 116-117]. The cell volumes of the iron antimonate mixed with antimony oxide and calcined at 800°C are identical to those of pure iron antimonate [R.G. Teller, J.F. Brazdil and R.K. Grasselli, *J. Chem. Soc., Faraday Trans.*, 81 (1985) 1693-1704 at the abstract and 1700]. This is further evidence that the presence of foreign oxides and variation in calcination temperature have no effect on the crystalline structure of iron antimonate. Even deposited on aluminum antimonate by impregnation and calcined at 750°C, iron antimonate displays a well-defined crystalline rutile-type structure. The crystallinity of aluminum antimonate also improves with increasing calcination temperature, producing single phase AlSbO_4 at 1050°C [G.I. Straguzzi and P.F. Dismore, *Powder Diffraction*, 2 (1987) 183-186 at 185]. Similar results have been reported for chromium antimonate, tin antimonate and other antimony-based mixed oxides [G.I. Straguzzi, K.B. Bishoff, T.A. Koch and G.C.A. Schuit, *J. Catal.*, 103 (1987) 357 at 363; G. Centi and F. Trifiro, *Catal. Rev. - Sci. Eng.*, 28 (1986) 165-184]. All of these solids are able to form crystallographic shear structures that makes possible exchange of metal cations and generation of mixed-valence intermediate phases without profound change in crystal structure [G.I. Straguzzi, K.B. Bishoff, T.A. Koch and G.C.A. Schuit, *J. Catal.*, 103 (1987) 357 at 364]. These structures remain stable at temperatures

as high as 1050°C, and X-ray diffraction analysis does not give any evidence of the co-presence of an amorphous phase together to the rutile-type structure [G. Centi and F. Trifiro, *Catal. Rev. – Sci. Eng.*, 28 91986) 165-184 at 173-174]. Amorphous mixed antimony-containing oxides can be obtained by calcining precipitates at temperatures 500°C and lower [G.I. Straguzzi, K.B. Bishoff, T.A. Koch and G.C.A. Schuit, *J. Catal.*, 103 (1987) 357 at Table 1; Z. Tianshu and P. Hing, *J. Material Science: Materials in Electronics*, 10 (1999) 509 at Fig. 4 and 510]. Calcination at higher temperatures leads to the transformation of amorphous material to the crystalline one [see Figure 4 in Z. Tianshu and P. Hing, *J. Material Science: Materials in Electronics*, 10 (1999) 509], and not vice versa.

Taking into consideration the above stated, it appears that crystalline iron antimonate mixed with raw materials for V, Mo, W and other components and calcined at temperatures from 400 to 900°C, as it is described in Sasaki, will retain its crystallinity in the prepared catalyst. Sasaki realizes this claiming that "...catalyst composition contains a crystalline iron antimonate" (see claims 1 and 5 in Sasaki). Moreover, Sasaki emphasizes that "catalyst compositions containing no a crystalline iron antimonate are considerably inferior in catalyst activity and physical properties," (col. 3, lines 10-12).

Sasaki comparative examples do not teach or suggest Applicants' claimed subject matter.

Comparative examples 1-2 of Sasaki are all based on the catalyst formula in example 1, that formula being $\text{Fe}_{11}\text{Sb}_{20}\text{V}_8\text{Mo}_1\text{W}_{0.5}\text{O}_{81}(\text{SiO}_2)_5$. This catalyst formula does not include the presence of aluminum. Applicants' claimed subject matter requires the presence of aluminum. The formula recited in Applicants' claim is $\text{AaB}_b\text{Sb}_c\text{V}_d\text{Al}_e\text{O}_x$ wherein A is an alkali or alkaline earth metal; B is one or more optional elements selected from zinc, cadmium, lead, nickel, cobalt, iron, chromium, bismuth, gallium, niobium, tin,

and neodymium; and a is 0 to 0.3, b is 0 to 5, c is 0.5 to 10, d is 1, e is 3-10, $7 \leq a+b+c+d+e \leq 25$, and x is determined by the valence requirements of the elements present. Sasaki comparative examples 3 and 4 also are lacking in aluminum.

It is apparent by comparison of the formula in the Sasaki comparative examples and the formula recited in Applicants' claims that the subject matter of the claims do not overlap. Applicants respectfully request that the 35 U.S.C. § 103(a) rejection be withdrawn and a Notice of Allowance be given.

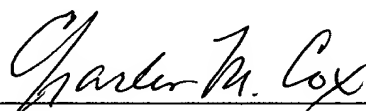
CONCLUSION

The prior art made of record, but not specifically cited, is not believed to disclose any significant information that is not sufficiently discussed in this Response.

It is respectfully submitted that all issues and rejections have been adequately addressed and that all claims pending are now allowable and that this case should be advanced to issuance.

If the Examiner has any questions or wishes to discuss the claims, the Examiner is encouraged to call the undersigned at the telephone number indicated below.

Respectfully submitted,



Charles M. Cox, Reg. No. 29, 057

Date: Dec. 29, 2000
AKIN, GUMP, STRAUSS, HAUER & FELD, L.L.P.
711 Louisiana, Suite 1900
Houston, Texas 77002
Telephone: (713) 220-5800
Facsimile: (713) 236-0822

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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231 on the 29 day of December, 2000.

Charles M. Cox

Charles M. Cox, Reg. No. 29, 057